

## CLAIMS

What is claimed is:

1. A crystalline alpha-chromium oxide where from about 0.05 atom % to about 6 atom % of the chromium atoms in the alpha-chromium oxide lattice are replaced by trivalent cobalt atoms.
2. A chromium-containing catalyst composition comprising as a chromium-containing component the crystalline cobalt-substituted alpha-chromium oxide of Claim 1.
3. A chromium-containing catalyst composition comprising a chromium-containing component prepared by treating the crystalline cobalt-substituted alpha-chromium oxide of Claim 1 with a fluorinating agent.
4. A process for changing the fluorine distribution in a hydrocarbon or a halogenated hydrocarbon in the presence of a catalyst, characterized by:
  - using as the catalyst a composition comprising at least one chromium-containing component selected from the group consisting of the crystalline cobalt-substituted alpha-chromium oxide of Claim 1 and a crystalline cobalt-substituted alpha-chromium oxide of Claim 1 which has been treated with a fluorinating agent.
5. The process of Claim 4 wherein the fluorine content of a halogenated hydrocarbon compound or an unsaturated hydrocarbon compound is increased by reacting said compound with hydrogen fluoride in the vapor phase in the presence of said catalyst composition.
6. The process of Claim 4 wherein the fluorine content of a halogenated hydrocarbon compound or a hydrocarbon compound is increased by reacting said compound with HF and Cl<sub>2</sub> in the vapor phase in the presence of said catalyst composition.
7. The process of Claim 4 wherein the fluorine distribution in a halogenated hydrocarbon compound is changed by isomerizing said halogenated hydrocarbon compound in the presence of said catalyst composition.
8. The process of Claim 4 wherein the fluorine distribution in a halogenated hydrocarbon compound is changed by disproportionating said halogenated hydrocarbon compound in the vapor phase in the presence of said catalyst composition.
9. The process of Claim 4 wherein the fluorine content of a halogenated hydrocarbon compound is decreased by dehydrofluorinating

said halogenated hydrocarbon compound in the presence of said catalyst composition.

10. The process of Claim 4 wherein the fluorine content of a halogenated hydrocarbon compound is decreased by reacting said  
5 halogenated hydrocarbon compound with hydrogen chloride in the vapor phase in the presence of said catalyst composition.

11. A method for preparing a composition comprising the crystalline cobalt-substituted alpha-chromium oxide of Claim 1, comprising:

- 10 (a) co-precipitating a solid by adding ammonium hydroxide to an aqueous solution of a soluble cobalt salt and a soluble trivalent chromium salt that contains at least three moles of nitrate per mole of chromium in the solution and has a cobalt concentration of from about 0.05 mole % to about 6 mole % of the total concentration of cobalt and chromium  
15 in the solution; and after at least three moles of ammonium per mole of chromium in the solution has been added to the solution;
- (b) collecting co-precipitated solid formed in (a);
- (c) drying the collected solid; and
- 20 (d) calcining the dried solid.

12. The method of Claim 11 wherein the soluble cobalt salt is a divalent cobalt salt.

13. The method of Claim 12 wherein the soluble cobalt and chromium salts are nitrates or hydrated nitrates

25 14. The method of Claim 12 wherein more than three moles of ammonium nitrate per mole of chromium is present in the aqueous solution.